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चालू बिजली की लाईन पर कार्य करना — गुणता आश्वासन योजनाओं के मार्गदर्शी सिद्धान्त

Indian Standard

LIVE WORKING — GUIDELINES FOR QUALITY ASSURANCE PLANS

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Tools and Equipment for Live Working Sectional Committee, ET 36

NATIONAL FOREWORD

This Indian Standard which is identical with IEC 1318 (1994) [renumbered as IEC 61318 : (1994)] 'Live working — Guidelines for quality assurance plans' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Tools and Equipment for Live Working Sectional Committee (ET 36) and approval of the Electrotechnical Division Council.

The text of the IEC standard has been approved as suitable for publication as Indian Standard without deviations.

In the adopted standard, certain terminology and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

Only the English language text of the International Standard has been retained while adopting it as Indian Standard, and as such the page numbers given here are not the same as in IEC Publication.

CROSS REFERENCES

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their places are listed below, along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 50 (151) : 1978[1] International Electrotechnical Vocabulary (IEV) – Chapter 151 : Electrical and magnetic devices	IS 1885 (Part 74) : 1993 Electrotechnical vocabulary : Part 74 Electrical and magnetic devices	Identical
IEC 410 : 1973[1] Sampling plans and procedures for inspection by attributes	IS 2500 (Part 1) : 2000 Sampling procedure for inspection by attributes: Part 1 Sampling schemes indexed by acceptance quality limit (AQL) for lot by lot inspection (*third revision*)	Not equivalent
ISO 8402 : 1986 Quality – Vocabulary ISO 9000 : 1987 Quality management and quality assurance standards – Guidelines for selection and use [2]	IS/ISO 9000 : 2000 Quality management systems – Fundamentals and vocabulary (*second revision*)	Identical to ISO 9000 : 2000

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[1] These standards have been renumbered as IEC 60050 (151) :1978 and IEC 60410 : 1973 respectively.

[2] These standards have been merged/revised as ISO 9000 : 2000.

(*Continued on third cover*)

Indian Standard

LIVE WORKING — GUIDELINES FOR QUALITY ASSURANCE PLANS

1 General

1.1 *Scope*

This technical report establishes the guidelines for the plans and procedures, as prepared by TC 78, assuring the quality of tools and equipment used for live working on electrical installations.

This report incorporates the concept of quality assurance based on the ISO 9000 series and also integrates a single sampling plan and procedure using normal inspection and special inspection levels based on IEC 410.

1.2 *Normative references*

The following normative documents contain provisions which, through reference in this text, constitute provisions of this technical report. At the time of publication, the edition indicated was valid. All normative documents are subject to revision, and parties to agreements based on this technical report are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(151): 1978, *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 410: 1973, *Sampling plans and procedures for inspection by attributes*

ISO 8402: 1986, *Quality – Vocabulary*

ISO 9000: 1987, *Quality management and quality assurance standards – Guidelines for selection and use*

ISO 9001: 1987, *Quality systems – Model for quality assurance in design/development, production, installation and servicing*

ISO 9002: 1987, *Quality systems – Model for quality assurance in production and installation*

ISO 9003: 1987, *Quality systems – Model for quality assurance in final inspection and test*

ISO 9004: 1987, *Quality management and quality system elements – Guidelines*

2 Definitions

For the purpose of this technical report, the following definitions apply:

2.1 **sampling plan:** Plan indicating the number of units of product from each lot or batch which are to be inspected (sample size or series of sample sizes) and the criteria for determining the acceptability of the lot or batch (acceptance and rejection numbers).

2.2 **inspection level:** Level determining the relationship between the lot or batch size and the sample size.

2.3 **single sampling plan:** The number of sample units inspected is equal to the sample size given by the plan. If the number of defectives found in the sample is equal to or less than the acceptance number, the lot or batch shall be considered acceptable. If the number of defectives is equal to or greater than the rejection, the lot or batch is rejected.

2.4 **critical defect:** Defect that judgment and experience indicate is likely to result in the hazardous or unsafe conditions for individuals using, maintaining or depending upon the product or a defect that judgment and experience indicate is likely to prevent performance of the function of a major end item such as tools or equipment used in live working.

2.5 **major defect:** Defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the unit for its intended purpose.

2.6 **minor defect:** Defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit.

2.7 **acceptable quality level (AQL):** Maximum per cent defective (or the maximum number of defects per hundred units) for purposes of sampling inspections, that can be considered satisfactory as a process average.

2.8 **formation of lots or batches:** The product is assembled into identifiable lots, sub-lots, batches, or in such other manner as may be prescribed (see 5.4 of IEC 410). Each lot or batch, as far as is practicable, consists of units of product of a single type, grade, class, size and composition, manufactured under essentially the same conditions and at essentially the same time.

2.9 **lot or batch size:** Number of units or product in a lot or batch.

2.10 **unit of product:** Thing inspected in order to determine its classification as defective or non-defective or to count the number of defects. It may be a single article, a pair, a set, a length, an area, an operation, a volume, a component of an end product, or the end product itself. The unit of product may or may not be the same as the unit of purchase, supply, production or shipment.

2.11 **sample:** One or more units of product drawn from a lot or batch, the units of the sample being selected at random without regard to their quality. The number of units of product in the sample is the sample size.

2.12 **type test:** Test performed on one or more devices made to a certain design to show that the design meets certain specifications. [IEV 151-04-15, modified]

2.13 **routine test:** Test to which each device is subjected during or after manufacture to ascertain whether it complies with certain criteria. [IEV 151-04-16, modified]

2.14 **sampling test:** Test performed on a number of devices taken at random from a batch. [IEV 151-04-17, modified]

2.15 **acceptance test:** Contractual test to prove to the customer that the device meets certain conditions of its specification. [IEV 151-04-20]

3 Principles

The assurance of a quality system applicable in the specifications prepared by TC 78 is developed through the application of quality systems specified by ISO standards 9000, 9001, 9002, 9003, 9004 and 8402, and supplemented by the sampling plan and procedure of IEC 410.

ISO Standards 9000 and 9004 are considered for each specification according to their applicability with the said product.

4 Categories of tests

There are four categories of tests: type, routine, sampling and acceptance.

Information on the sampling test requirements to assure quality of a product is included in a subclause entitled "Quality assurance". If the nature of the product does not lend itself to the application of the standards on the quality assurance plan due to its nature, then sampling plan(s) and procedure(s) shall be specified. In this case, the procedure used shall be specially developed to meet the required quality assurance objectives. The sampling procedure does not have to follow in its entirety that provided by IEC 410.

The annex on sampling plan(s) and procedures shall include the information on the classification of defects (minor or major) and the reference to the tests clause of the specification.

5 Quality assurance plan

In order to assure that the delivery of product(s) meets the requirements of the standards prepared by TC 78, the manufacturer shall employ an approved quality system that complies with the provisions of ISO 9000 and ISO 9004. Specific additional requirements delineated in these standards shall be evaluated for each standard. The selection of the model for quality assurance is included in each of the following three standards. Each contains certain elements grouped into three distinct models of a functional or organizational nature, as required by the standards for the supply of a product or service.

a) ISO 9001: This standard is to be used when conformance to specified requirements is to be assured by the supplier during several stages which may include design/ development, production, installation and servicing.

b) ISO 9002: This standard is to be used when conformance to specified requirements is to be assured by the supplier during production and installation.

c) ISO 9003: This standard is to be used when conformance to specified requirements is to be assured by the supplier solely at final inspection and testing.

5.1 *Applicable clauses and subclauses of ISO 9000 and ISO 9004*

- ISO 9000, clause 5: Characteristics of quality system situations. This clause gives the information on when to use contractual and non-contractual quality systems.

- ISO 9000, clause 6: Types of International Standards on quality systems. This clause gives guidance to all organizations for quality management purposes.

- ISO 9000, clause 8: Use of International Standards on quality systems for contractual purposes; 8.2: Selection of model for quality assurance; 8.2.3: Selection factors; 8.5: Contract preparation aspects of contracts (including those tailored for a specific application of need).
- ISO 9004, subclause 8.3: Product testing and measurement. This subclause indicates the demonstrative quality system elements that shall be incorporated into any system, and also the nature and degree of documentation required to support that the party has complied with the entire quality assurance system requirements.
- ISO 9004, subclause 8.4: Design qualification and validation. This subclause specifies the pre-contract assessment required directly or via another party (third party for verification). This agreement forms a part of the entire compliance documentation associated with the basic technical specification (e.g. document on gloves and mitts, etc.).
- ISO 9004, subclause 11.2: Material control and traceability. This subclause gives the standards related to traceability.
- ISO 9004, subclause 17.3: Quality records. This subclause gives standards related to quality records. The records shall be maintained at least for the period specified by the purchaser, but no less than eight years.

5.2 *Selection of quality system elements*

When it is required to use ISO 9001, 9002 and 9003, the selection of the quality system elements shall be based on annex A. The choice of the clauses and information is based on whichever ISO standard applies.

6 Sampling procedure for quality assurance

The quality assurance system shall integrate the requirements of the sampling plan as given in annex A. The sampling procedure does not follow the guidance provided in IEC 410, because the nature of the product, the safety of the personnel involved and the quantity produced do not lend themselves to the application of this standard in its entirety. Since these important distinctions exist, special individual quality assurance measures are herein incorporated.

The sampling plan and procedure developed in this technical report are based on the type of defect likely to be found in the material and equipment covered in the documents prepared by TC 78 (see examples in annex B). The defects are identified as to whether they are critical, major or minor.

a) *Defects of critical nature* – For this condition, each unit shall be tested (routine test).

b) *Defects of a major and minor nature* – In this case, tests (whether they are destructive or not) shall be carried out on samples only (sampling test). The acceptable quality level (AQL) and inspection level (IL) are selected depending on whether the defects are major or minor.

The choice is made in the following way:

- firstly by acceptable quality level required (AQL);
- secondly by the lot size.

The *acceptable quality level (AQL)* is selected as follows:

- for major defects – AQL 2,5;
- for minor defects – AQL 10.

NOTE – For major defects, if AQL 2,5 is deemed too severe for certain tests, a third AQL level of 4,0 may be used.

The *Inspection level (IL)* is as follows:

- S-3 for larger lots;
- S-4 for smaller lots.

In the development of the sampling tables, a combination of inspection level S-3 and S-4 have been used.

Using these principles, the following sampling plan tables have been developed.

Table 1 – Sampling plans for major defects (AQL 2,5)

Lot size	Sampling size	Ac*	Re**
2 to 150	5	0	1
151 to 35 000	20	1	2

* Ac: Acceptance criterion (maximum allowable number of defectives)

** Re: Rejection criterion (rejected if the number of defectives is equal to or greater than this number)

Table 2 – Optional sampling plan for major defects (AQL 4,0)

Lot size	Sampling size	Ac*	Re**
2 to 90	3	0	1
91 to 3 200	13	1	2
3 201 to 35 000	20	2	3

* Ac: Acceptance criterion (maximum allowable number of defectives)

** Re: Rejection criterion (rejected if the number of defectives is equal to or greater than this number)

Table 3 – Sampling plan for minor defects (AQL 10)

Lot size	Sampling size	Ac*	Re**
2 to 90	5	0	1
91 to 150	8	2	3
151 to 3 200	13	3	4
3 201 to 35 000	20	5	6

* Ac: Acceptance criterion (maximum allowable number of defectives)

** Re: Rejection criterion (rejected if the number of defectives is equal to or greater than this number)

7 Procedure for selection of type of test and sampling plan

In each standard, the nature of the defect related to each test shall be identified as being critical or major or minor.

- For tests related to critical defects, the routine test is carried out (on each unit).
- For tests related to major defects to be defined for each tool, use table 1 (AQL 2,5) or table 2 (AQL 4,0), if deemed too severe.
- For tests related to minor defects, use table 3 (AQL 10).

8 Other requirement

All documents should include an annex entitled "Acceptance tests" (see annex A).

Annex A
(informative)

Acceptance test

As defined in IEV 151-04-20, an acceptance test is a contractual test to prove to the customer that the device meets certain conditions of its specification. These tests may be carried out on every unit (routine tests) or on a sampling of the units (sampling tests).

If the customer indicates in his specification that the device meets this specification, the acceptance tests are those (both routine and sampling) which are specified in this document.

The customer may, however, if he wishes, ask for additional tests or modify the sampling size but he shall include this in his own specification.

The customer may wish to witness the tests, or have someone else witness them or he may simply accept the results of the tests as carried out by the manufacturer. He may also specify that the tests be carried out in an independent laboratory of his choosing or even in his own laboratory.

NOTE – The customer may specify the additional tests or larger sampling sizes when he is purchasing from a new manufacturer, because he has experienced problems with a particular manufacturer, or because he is purchasing a new product or a new design.

Annex B
(informative)

Different types of tests

Table B.1 – Examples of different types of tests

Description	Tests [1, 2]
Prototype	Type test
Production	Routine and sampling test
Delivery	Acceptance test, routine test and/or sampling test

1 Routine tests are non-destructive; sampling tests may be destructive.

2 Generally destructive testing is associated with either type and sampling tests while non-destructive testing may become destructive.

Table B.2 – Information relative to defects

Types of defect	Tests
Critical Major (2,5) Minor (10)	Dielectric – proof Dielectric – withstand Mechanical Puncture Tear resistance Tension test Thickness Flame retardancy

This example is covered in a document prepared by TC 78 for flexible protective equipment.

(*Continued from second cover*)

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 9001 : 1987 Quality systems – Model for quality assurance in design/development, production, installation and servicing	[1] IS/ISO 9001 : 2000 Quality management systems — Requirements (*second revision*)	Identical to ISO 9001 : 2000
ISO 9002 : 1987 Quality systems – Model for quality assurance in production and installation		
ISO 9003 :1987 Quality systems – Model for quality assurance in final inspection and test		
ISO 9004 : 1987 [1] Quality management and quality system elements — Guidelines	IS/ISO 9004 : 2000 Quality management systems — Guidelines for performance improvements (*fifth revision*)	Identical to ISO 9004 : 2000

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding of numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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[1] These standards have been merged / revised as ISO 9001 : 2000 and ISO 9004 : 2000 respectively.

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